EFFICIENT STOCK CONTROL MANAGEMENT SYSTEM

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THESIS SUBMITTED IN FULFILMENT OF THE DEGREE OF COMPUTER SCIENCE (COMPUTER SYSTEMS & NETWORKING)

FACULTY OF COMPUTER SYSTEMS & SOFTWARE ENGINEERING

2013

ABSTRACT

This paper presents a pleasant automated system for stock management. Inventory system is important for industry to manage their things. The objectives of this paper are to help industry to manage inventory competently, improve performance and efficiency in handling inventory. Since the project will focus on small industry, the equipment used is not costly. The material used is software applications for keeping data and produce report of items and sale. Basically, the system will help user in key-in data using the items' code. Then, the system will generate data based on function it is asked such as sales report and detect goods in and out of store. The system is user friendly and it is useful for newbie to become familiar with new system.

ABSTRAK

Kertas ini membincangkan sistem automatik untuk menyenangkan pengurusan stok. Sistem inventori adalah penting bagi industri untuk menguruskan aktiviti mereka. Objektif kertas ini adalah untuk membantu industri untuk menguruskan inventori dengan lebih cekap, meningkatkan prestasi dan kecekapan dalam mengendalikan inventori. Projek ini akan memberi tumpuan kepada industri kecil, oleh itu, peralatan yang digunakan tidak mahal. Bahan yang digunakan adalah aplikasi perisian untuk menyimpan data dan menghasilkan laporan barangan dan jualan. Pada asasnya, sistem ini akan membantu pengguna dalam mengisi maklumat menggunakan kod barangan. Kemudian, sistem akan menjana data berdasarkan fungsi yang diminta seperti melaporkan jualan dan mengesan barang-barang yang masuk dan keluar dari kedai. Sistem ini adalah mesra pengguna dan ia adalah berguna untuk pengguna baharu agar dapat membiasakan diri dengan sistem baru.

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PART 1

INTRODUCTION

1.1 Purpose of the Project

1.1.1 Background of Study

An inventory control system is a system that encompasses all aspects of managing a company's inventories; purchasing, shipping, receiving, tracking, warehousing and storage, turnover, and reordering ("Inventory Control Systems," n.d.). Besides, Jane (n.d.) encounters that inventory systems are tracking systems that inform the amount of raw materials, supplies or final products that have readily available. The inventory system is updated each time an item is sold or used of raw materials to create a product. Her point toward inventory system is to keep track the items available in our store. If we know the availability of materials, we can easily satisfy the needs of our customers when they reach us. The inventory system informs us when we need to purchase more products or supplies.

Henderson (2011) writes that efficient tracking inventory is a vital component to a small business successful operation. By having up-to-date data regarding all needed office supplies, raw manufacturing materials and merchandise for sale, an organization will drastically increase its bottom line. Furthermore, it has advantages in the terms of

funds; by not reordering unnecessary goods, times; when an enterprise will be better positioned to services customers quickly, and performance; as we can navigate any unexpected changes in business. Although many companies maintain this information manually, there are benefits to using a computerized inventory system.

1.1.2 Problem Statement

Usually, school cooperative (school shop) opens only during recess time, which takes 20 to 30 minutes, since at other time teachers and students have lessons in class. Many students will come at that time to buy necessary things. With manual calculation of products, it will take time. Thus, there will be long queue just to make payment. This will waste students' time and some of them will not have enough time to take their meal.

Besides, the chance to make wrong calculation is also high when dealing with many things. Furthermore, school cooperative does not require high profit. So, cheap tool to solve or reduce its problems is really helped.

Moreover, Norul Aswin (2009) determines that there is no systematic inventory system for Sekolah Rendah Islam Hidayah (SRIH) to manage its cooperative operation because it stills using manual system. The management also does not have an effective inventory checking method to keep track on available inventory and also facing difficulties to make decision regarding the quantity they should order for certain inventory.

In addition, traditional centralized, sequential inventory system and control mechanisms are insufficiently flexible to respond to highly dynamic variations in customers' requirements. The traditional approaches limit the expandability and reconfiguration capabilities of the inventory systems (Norazila, 2002).

1.1.3 Description of Main Aim(s)

The main key of this paper is to help small industry to manage their inventory. Usually, small industry does not gain high profit that ought them to use advanced system. Hence, it is sufficient to facilitate them with automated system and at the same time not so costly that will burden them. It is believed that with computerized system will help this small entrepreneur to stay in the market.

1.1.4 Objective(s)

The objectives of this research are:

a) to develop an automated system for stock management
b) to improve performance and efficiency in handling inventory
c) to manage and keep track goods in storage

1.1.5 Scope and Limitation of Study

Basically, the scope of project contributes with staffs, who organize the shop, and students as customers. With technology that will be proposed, it helps staff in reducing stress, easy control of goods and effective way to calculate products. Then, students will save their time and to have satisfaction with better management.

This technology will focus on space of Windows operating system. Then, it is limited to goods that usually be sold at school shop. The programming language used is Microsoft Visual Studio 2010 and database is Microsoft Office Access 2003.

The system will be automated with basic function such as save, edit, retrieve and update data. In addition, the system will be added with detection of product in and out from store, total of product in store as well as sales report. The products are bound to things that fulfill students' necessity such as sport t-shirt and stationary.

1.1.6 Outline of material presented in report

This report is organized as follows. The first part presents the introduction of this research. It includes the background and problem statement, research objectives as well as scope of this research. This part also reviews the related literature relating to the research objectives of this report as well as studies the previous and existing systems. Furthermore, part two focuses on the instrument or method used to conduct the study on efficient inventory system. Then, part three will conclude the thesis paper and make some suggestion for future study.

1.2 Existing System

1.2.1 Description of Existing System

General structure and design of existing system

Basically, inventory system helps human to manage, control, and make sure the goods in stock are well managed and organized. Years ago, before computerized system is applied, people used manual system to keep track of their inventory. Before computer has been invented, paper tables and paperwork solutions, as in Figure 1.0 and 1.1, were being used as inventory management tools (Arsan, Başkan, Ar & Bozkus, 2011). However, these we very far from being a solution, took so much time, even needed employees just for this section of organization.

There was no an efficient solution available in the many companies during these days. Every process was based on paperwork, human fault rate was high, the process and the tracing the inventory losses were not possible, and there was no efficient logging systems. Lister (2011) thinks that although manual inventory system can cost as little as a sheet of paper and a pencil, its accounting for inventory can saves time because a business owner does not have to scan items into an automated system. Thus, they can be read and deducted from a computerized inventory when sold. Saving time also saves money.

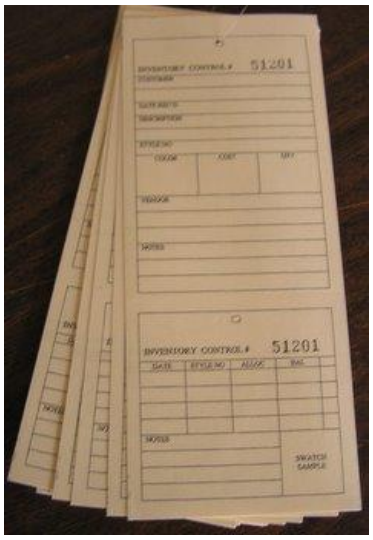

Figure 1.2.1 Sample of receipt

Inventory Tracking

Department	Location

Item #	Description	Qty	Last Date Updated

Figure 1.2.2 Sample of invoice

Then, the world keeps moving forward. Inventory system starts to be computerized and kept in database. At first, it is not advance like nowadays because any data and information wants to keep in database still need to be key-in manually. Next, barcodes was created and used to keep track the goods. It provides a simple and inexpensive method of encoding text information which can be easily read using electronic readers.

Barcode technology and processing provide a fast and accurate tool to enter data without keyboard data entry. Barcodes are much quicker, more efficient entry of information and are inexpensive and easy to implement.

Implementation of technology

One existing system is Bronze Inventory System with Point of Sale (POS).

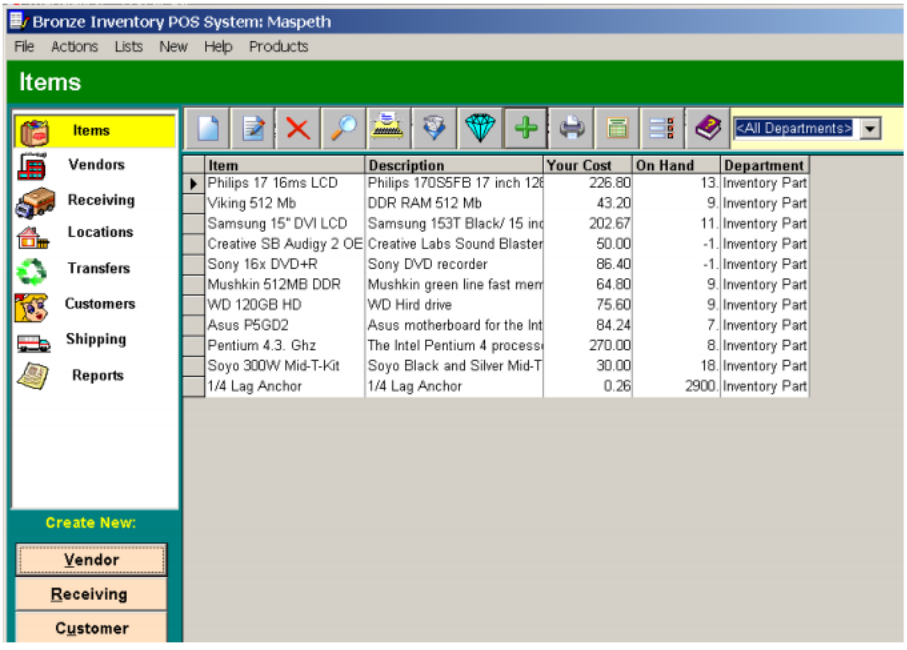

Figure 1.2.3 Basic GUI of Bronze Inventory System

Bronze Inventory System (BrInSy) is the universal inventory management and point of sale system .You can use this system in your business, office and home. This system will guide you through the creation of vendors list, products list, receiving lists, invoices, sale receipts and cash receipt. This is in addition to product labels with barcodes, transfer orders between locations and various types of reports for monitoring your business.

BrInSy Features:

- The simple intuitive interface.
- BrInSy is a multi-user and multi-warehouse system.
- Supports non-stock and non-depleting product codes.
- Calculates sale prices of the list or cost prices.
- Usage separate product descriptions for invoices and purchase orders.
- BrInSy calculates real-time on hand stock levels on different warehouses10. You can independently set up the appearance of the invoice, item receipt and sales receipt.
- The system and in addition to printing the documents, it can also send E-mails from its own program.
- The system is protected with data access control. It can restrict the unauthorized users from having full access to the database by limiting their access to certain management or confidential information.
- BrInSy supports using discounts, shipping and two types of taxes in the invoices and orders.
- Backups and restores databases and many other powerful features.
- Exports and Imports information from csv (comma-separated-value files, Excel and QuickBooks.

1.2.2 Method(s) of Approach

Shazia Arshad, Muhammad Shoaib and Muhammad Sajjad Khan use System Development Life Cycle (SDLC) as their technique to computerized inventory system (2000). Their paper is to propose software can help to improve the efficiency of Store Department of University of Agriculture, Faisalabad because the current system is manual. Its SDLC consist a few phases:

1. Preliminary investigation and analysis
   - This phase is to understand the existing system, determine true nature of problem, objectives and advantages of proposed system, and recognize user requirements.

2. Design
   - The phase is conducted in the following steps: select software and hardware requirements, design input and output forms and reports.

3. Development
   - The development of designed system was carried out by develop the computer program, testing of computer program with sample data and also testing the program with real data.

Besides, there are several techniques to forecast and predict goods in stock. Earlier, Artificial Intelligence and Machine Learning like Support Vector Machines, Artificial Neural Networks (ANNs) and Fuzzy Logic have been applied to solve excess goods (Aditya Gupta, 2012).

But the most unbeaten is ANNs, even quite limited in performance and not reliable enough. In addition, a system based on a recurrent neural network showed appropriate accuracy, which used extract feature using the Autoregressive Integrated Moving Average (ARIMA) (Wang & Leu, 1996).

Recently, the Hidden Markov Model (HMM) approach is used to analyze and predict time depending phenomena or time series. The metric used to evaluate the performance of the algorithm is Mean Absolute Percentage Error (MAPE) in accuracy. MAPE is the average absolute error between the actual stock values and the predicted stock values in percentage

$$MAPE = \frac{1}{n}\sum_{i=1}^{n}\frac{|p_i - a_i|}{|a_i|} \times 100\%$$

.

Where a_i is the actual stock value,

p_i is the predicted stock value on day i,

n is the number of days for which the data is tested

An HMM is based Maximum a Posteriori (MAP) estimator for stock prediction. The model uses a latency of days to predict the stock value for the $(d + 1)^{st}$ day. A MAP decision is made over all the possible values of the stock using a previously trained continuous-HMM.

Besides, there is a technique to reduce uncertainty in the data which is a Fuzzy Markov Model. However, this method is for the reliability evaluation of electric network components allowing for fuzzy quantities to comprise uncertainty in the data.

1.2.3 Problem in the Existing System

BrInSy has too much function that not fit for small enterprise. For example, it is not necessary for small industry to have slot to group products in storage location and department. It is because usually small shop uses limited space to store its product, just need to arrange it neatly.

Refer to Bronze Inventory System with Point of Sale (POS), it scopes are a simple but powerful inventory program with the Point of Sale panel. The inventory system works with MS Access files or with MS SQL Server database. System has 4 different retail prices. This software allows to create different reports in html and Excel formats.

The limitation is too much function that is believed not suitable with small industry like school shop. Then, the used of wired barcode reader has frontier the distance from the PC. The goods need to bring near the PC as to scan the barcode on those goods.

PART 2

REPORT BODY

2.1 User Requirement

The user who selected by is a teacher from SK Tanjong Mas, Kelantan. The user is chosen after several analyses of problems that arise in my mind. Thinking of there is still manual system in managing school shop, I come out of asking a few questions to the teacher.

Since she is quite blur about the computerize system, she just tell me her problems when dealing with manual system and the details are put on me. She wants a system that can:

a. help her to easily keep and manage data
b. track the products in and out of system
c. trigger message if the items less
d. predict what, when and how much to order goods from supplier
e. produce report of inventory

Furthermore, she suggests the system can be used by Windows operating system. The system can only support items that are sold in the school shop such as sport t-shirt and stationary.

2.2 Design Description

2.2.1 Flow Chart/Story board

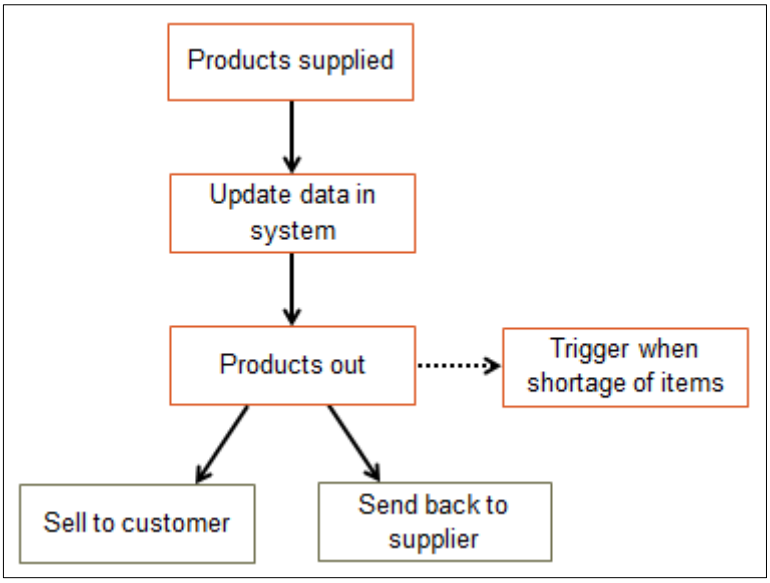

Figure 2.2.1 Workflow of the system

Figure 2.2.1 represents the overall workflow of the system. The system begins when staff enters information of products after receiving them from supplier. For the first time of key in, the system will consider it as process of getting the data into database. Once the code is entered, system will be updated. Then, in module out, the system will reflect as the item is moving out from the database.

Usually there are two reasons why the product is out of the system, the product is sold to customer or sent back to supplier because of labefaction. When the product is sold, it will go to process of sale that will calculate the price and amount of profit. However, if the product is out from system because of return to supplier, it will go to manual process.

During the process of updating data in system, which is out of the system, there is a trigger message to alert staff on quantity of items in stock. Furthermore, with this updating process, report can be generated as to keep track the whole goods in inventory.

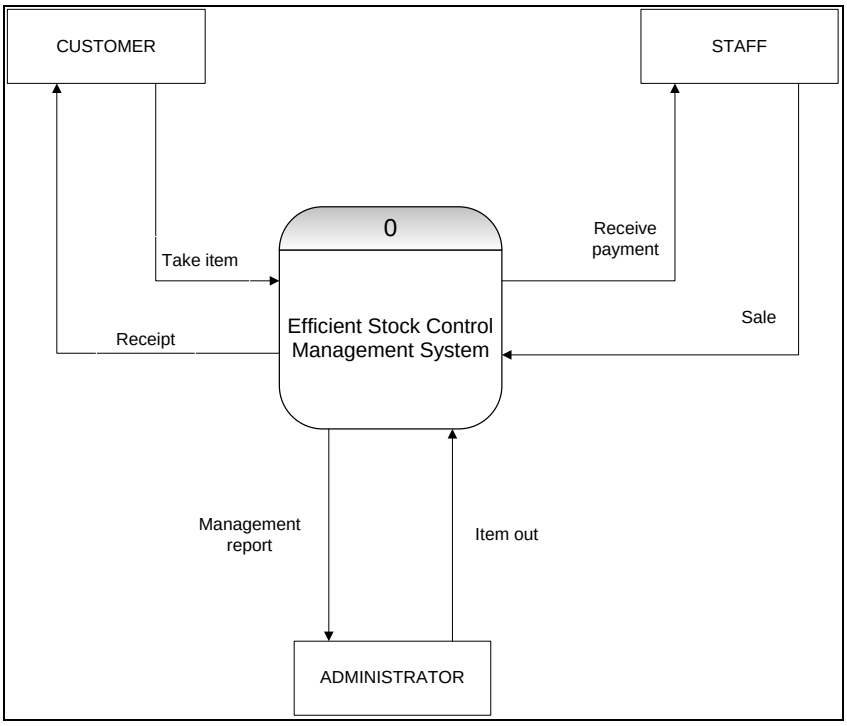

Figure 2.2.2 Context Diagram of inventory system

The context diagram above, Figure 2.2.2, represents the system of SK Tanjong Mas shop. Firstly, the customer takes items that he/she wants. Then, staff will receive the payment and enter the code of item in the system. After that, item is reduced based on quantity that has been taken out, entered by staff. In addition, customer can ask for the receipt. The staff collects the payment just after the customer satisfied with the items. Later, the administrator can retrieve the management report about the daily sale or item out.

Refer to Figure 2.2.3 below, it is about physical data flow in the system. First process is to collect payment. Customers will take items and bring it to staff. Then, staff will enter the code each items to calculate price and reduce the quantity of good from stock. Update sales database is the second process. Staff will receive the payment from customers just after they satisfied with the total amount of items they buy. Update inventory database is the third process.

The next process is update inventory database, once staff key in the code of items sold. Inventory data from process two will enter this process and the inventory data will formatted. After that, the data will be kept in the inventory database. Produce management report is the last process. Goods sold amount from sale database will be keyed-in into produce management report. With that, daily inventory depletion amount also will be entered into produce management report. This report can also be accessed by administrator.

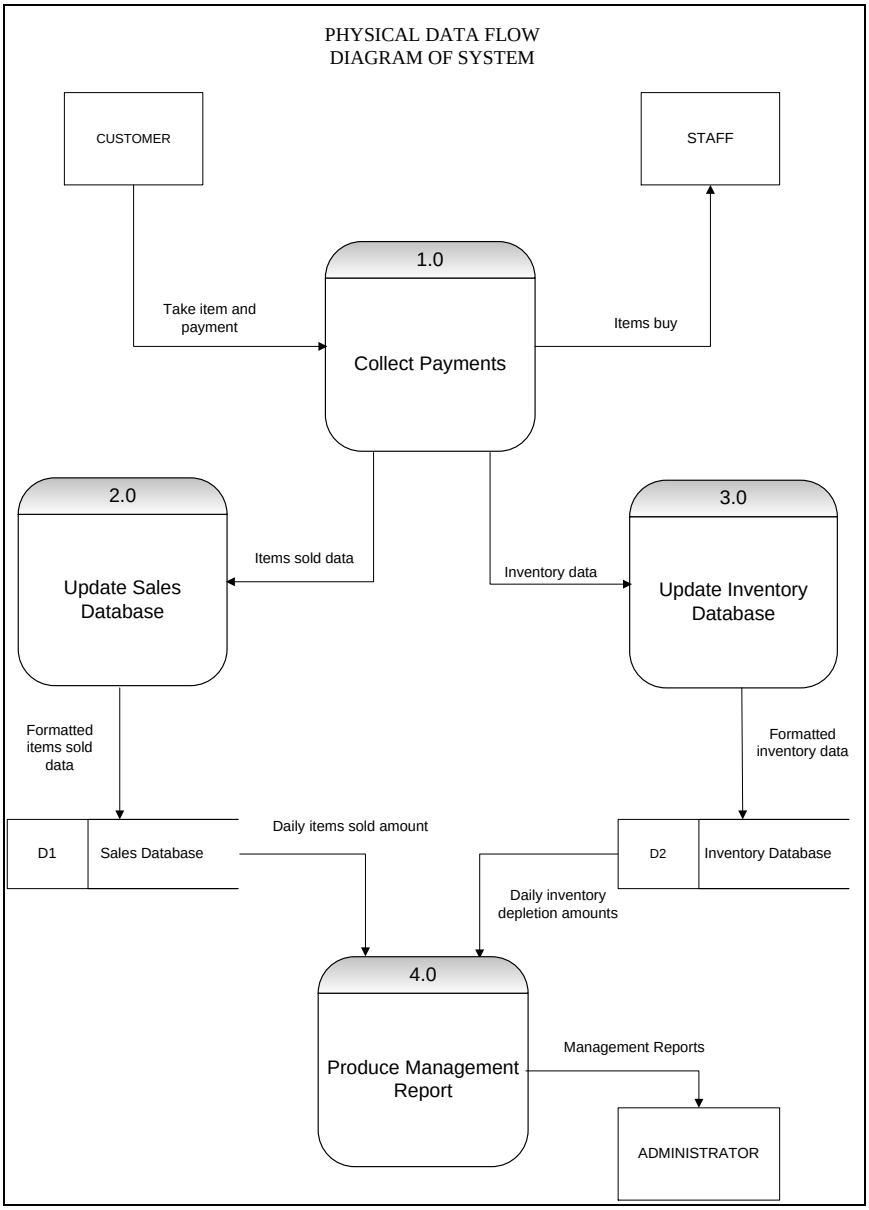

Figure 2.2.3 Level-0 Data Flow Diagram for inventory system

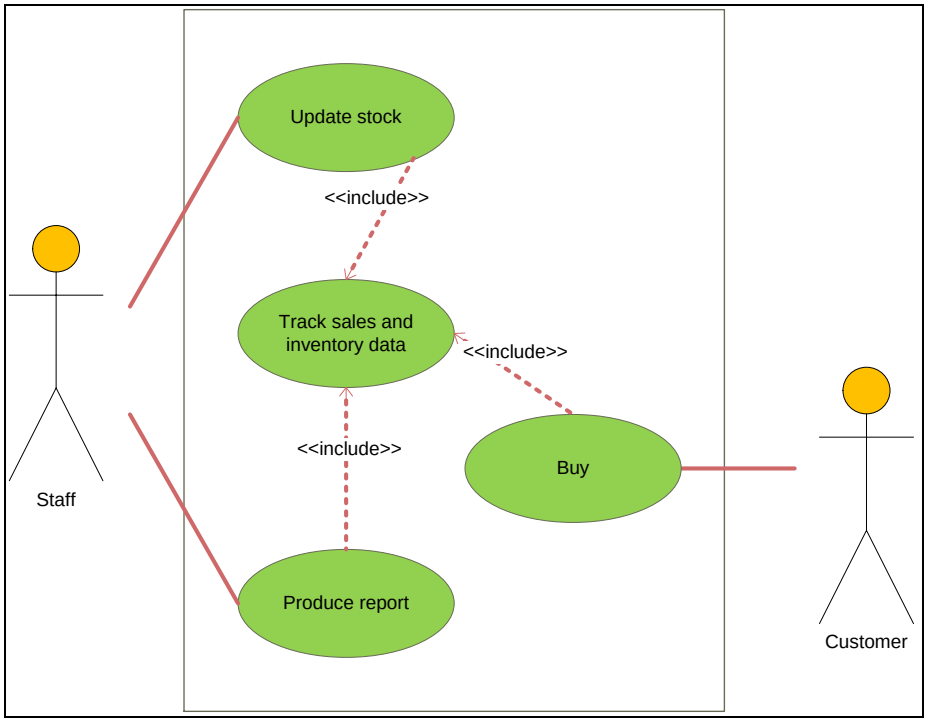

Figure 2.2.4 A use case diagram for an inventory system

Mainly, from Figure 2.2.4 of use case diagram, the process between user and customer does involve the system when the customer wants to make payment of the item(s) he/she buys. A staff will enter code of the product to identify the price and at the same time, the quantity of that product will reduce by one item and automatically update the data in the system. If the customer request for a receipt, the staff will print out the receipt.

In the end of sale day, staff can generate report as to recheck whether the information in the system is tally or not with the stock in rack. When the quantity of item reach the certain level, the system will give trigger message and there will be a highlight on the word of item that is in shortage. So, this will alert the staff to order items.

2.3 Method and Material

2.3.1 Technique/Theory/Modeling

The techniques used in inventory system will apply probability to avoid uncertainty of stocks whether over-or under of goods that should be available in-store. Moreover, forecasting formula should be applied to recognize the behavior of items is on demand or not. Then, a technique is required to predict or purpose when to order and how much to order of goods. This can be done by knowing the pattern of items by looking of the previous sale.

System Development Life Circle (SDLC) is chosen as the suitable methodology to ensure the project success. SDLC is a conceptual model used in project management that describe the stages involved in an inventory management system development project from initial to completed application. Various SDLC methodologies have been developed to guide the processes involved such as Rapid Application Development (RAD) and Waterfall.

Waterfall is one of the SDLC which follows a linear and sequential method to deliver software product. This model suggests some advantages such as simple and easy to implement, easier to manage, and each phase is executed one at a time.

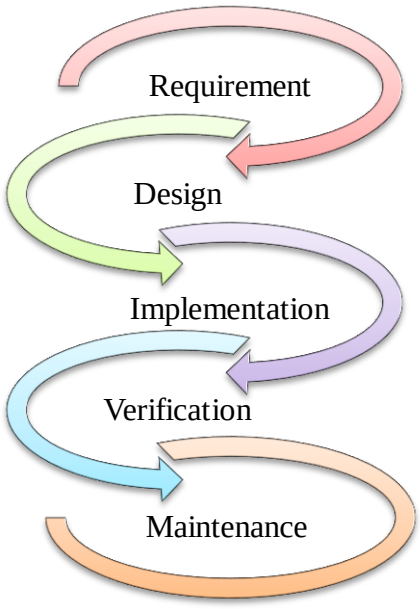

Figure 2.3.1 Waterfall phase